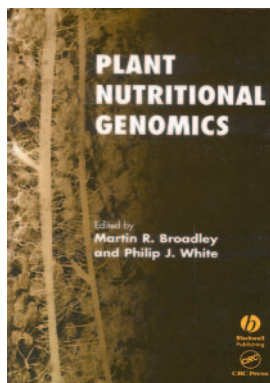


Book Reviews

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Plant nutritional genomics
Broadley MR, White PJ. eds.
2005.

Oxford: Blackwell Publishing.
£115 (hardback). 321 pp.

Plant nutrition is ultimately an applied subject that seeks to understand the processes and mechanisms that underpin the uptake, assimilation and internal redistribution of nutrients by plants and then to use this information to improve the yield or

quality of harvested plant parts, be they grains, storage roots or leafy vegetables. The subject now also encompasses the understanding of the responses of plants to nutrient toxicities (e.g. salinity) as well as new topics such as metal 'hyper-accumulation' and its exploitation in soil decontamination. Much of the most successful early work ('classical' plant nutrition) was done with field-grown crops with the aim of understanding the form, amount and timing of nutrient applications. The success of this research is illustrated by the high yields that can now be obtained when crops are adequately fed and also protected from pests and diseases. However, with the realisation that high fertilizer applications carry economic as well environmental costs, the emphasis over the last 20 years has switched to identifying opportunities for improving the efficiency with which nutrients are used, i.e. to obtain optimal yield and quality for minimal fertilizer use. For those interested in plant processes this has meant attempting to characterize the pathways through which nutrients are taken up and assimilated in order to identify those that might be beneficially manipulated. Today this means using high throughput 'omics' approaches to identify the network of gene products involved or, as the editors of this book put it, to define 'the interactions between a plant's genome and its nutritional characteristics'.

The book is divided into 13 chapters covering three distinct topics: the molecular physiology of individual nutrients, methods for studying plant nutritional genomics, and applications of the knowledge gained. The six 'nutrient' chapters are restricted to the five elements needed in largest amounts by plants (N, P, K, S and Ca) plus Na, which is important as a micronutrient in some plants but is mainly of interest because of its toxicity to plants exposed to salinity. The next four methodological chapters cover mapping of links between the genome and the 'ionome' in plants, transcriptional profiling of membrane transporters, exploiting natural genetic variation in nutrient content, and mapping nutritional traits. The final three chapters are more

applied and discuss constraints and opportunities in sustainable crop nutrition, improving delivery of minerals to humans and livestock, and the use of plants to manage sites contaminated with metals.

All chapters are about 20 pages long and each gives a good overview of its subject. For instance the nutrient-specific chapters provide excellent summaries of current knowledge of the molecular processes governing uptake, long-distance transport and assimilation of individual nutrients. They also highlight the gaps in our knowledge. Although information gained from high throughput methodologies, especially transcriptomics, is covered, much of the material is derived from more 'classical' molecular genetic approaches. Experts in areas covered by individual chapters will feel that much of the material has been published in reviews elsewhere, but those who are less immersed in any particular topic and who want to update themselves on it will find these chapters an invaluable resource. This is also true of the more methodological chapters, which provide overviews of the information that can be obtained from the individual approaches and how they might be combined into a comprehensive analysis. There is also food for thought in some of the chapters, particularly the one by R.F. Denison and E.T. Kiers on sustainable crop nutrition. This perceptive analysis raises questions about the simplistic assumptions that often underlie attempts to improve crop mineral-use efficiency and highlights areas where such attempts are likely to be useful and others where they are not. This reviewer certainly changed his thinking as a result of the ideas put forward.

The overall presentation is good. The typescript is easy to read, there is a pleasing lack of typographical errors, and diagrams, which are relatively few in number (2–4 per chapter), are clearly reproduced, including the occasional colour plate. There are no summaries at the start of chapters but there is an italicised section within the Introduction to each that provides a signpost to the content that is to follow. Literature citations are fairly comprehensive and are up-to-date to 2004.

This is a really good book that should be part of the personal library of all those working in plant nutrition. It should also be consulted by those who want to keep abreast of recent developments or use it as a basis for an initial but integrated introduction to the molecular physiology of nutrient acquisition and assimilation and how this knowledge can potentially be exploited. It will also be useful to those preparing advanced undergraduate or graduate-level lecture courses in plant nutrition.

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